Figs. 1,2 prior art

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222,316,326
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WHAT IS CLAIMED IS:

1. A method for timing recovery of a digital signal in a telecommunications receiver, comprising:

tracking a plurality of coefficients in a tracking buffer for timing drift,

centering the plurality of coefficients in the tracking buffer,

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filtering, through an equalizer, the digital signal with the plurality of coefficients, and

updating the plurality of coefficients in the tracking buffer.

2. A method for timing recovery of a digital signal according to claim 1, wherein:

the step of tracking the plurality of coefficients further comprises,

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summing a set of left coefficients,

summing a set of center coefficients,

summing a set of right coefficients,

comparing the set of left coefficients, the set of center coefficients, and the set of right coefficients to obtain a set with the greatest weighting; and

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the step of centering the plurality of coefficients further comprises centering the plurality of coefficients about the set with the greatest weighting.

3. A method for timing recovery of a digital signal in a telecommunications receiver, comprising:

splitting the digital signal into an in-phase input signal and a quadrature input signal,

tracking a plurality of coefficients in a tracking buffer for timing drift, wherein the coefficients are in-phase coefficients,

centering the plurality of in-phase coefficients in the tracking buffer,

centering the plurality of quadrature coefficients in the tracking buffer,

filtering, through an in-phase equalizer, the in-phase signal with the plurality of in-phase coefficients,

filtering, through a quadrature equalizer, the quadrature signal with the plurality of quadrature coefficients,

updating the plurality of in-phase coefficients in the tracking buffer, and

updating the plurality of quadrature coefficients in the tracking buffer.

4. A method for timing recovery according to claim 3, further comprising:

tracking a plurality of coefficients in a tracking buffer for timing drift, wherein the coefficients are quadrature coefficients.

5. A timing recovery device for processing a digital signal, comprising:

an equalizer for processing said digital signal,

a filter buffer for storing a plurality of equalizer coefficients to be applied to said equalizer, and

a buffer manager for tracking the equalizer coefficients within the filter buffer, and for shifting the coefficients within the filter buffer such that the coefficients remain substantially centered within the filter buffer.

6. A timing recovery device according to claim 5, wherein the tracking buffer further comprises:

a data tracking buffer for storing a portion of said signal, and

a coefficient tracking buffer for storing said equalizer coefficients.

7. A timing recovery device according to claim 5, further comprising:

a data tracking buffer for pointing to said portion of said signal stored in said tracking buffer, and

a coefficient tracking buffer for pointing to said equalizer coefficients.

8. A timing recovery device for processing a digital signal having an in-phase portion and a quadrature portion, comprising:

an in-phase equalizer for processing said in-phase portion of said signal;

an in-phase tracking buffer for storing a plurality of in-phase equalizer coefficients to be applied to said in-phase equalizer;

a quadrature equalizer for processing said quadrature portion of said signal;

a quadrature tracking buffer for storing a plurality of quadrature equalizer coefficients to be applied to said quadrature equalizer; and

a buffer manager.

9. A timing recovery device according to claim 8, wherein:

the buffer manager is designed for tracking the in-phase equalizer coefficients within the in-phase tracking buffer, for shifting the in-phase coefficients within the in-phase tracking buffer such that the in-phase coefficients remain substantially centered within the in-phase tracking buffer, and for shifting

the quadrature coefficients within the quadrature tracking buffer such that the quadrature coefficients remain substantially centered within the quadrature tracking buffer.

10. A timing recovery device according to claim 8, wherein:

the buffer manager is designed for tracking the quadrature equalizer coefficients within the quadrature tracking buffer, for shifting the in-phase coefficients within the in-phase tracking buffer such that the in-phase coefficients remain substantially centered within the in-phase tracking buffer, and for shifting the quadrature coefficients within the quadrature tracking buffer such that the quadrature coefficients remain substantially centered within the quadrature tracking buffer.

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Amendment to the Claims:

The claims under examination in this application, including their current status and changes made in this paper, are respectfully presented.

1 (currently amended). A method for timing recovery of a digital signal in a telecommunications receiver, comprising:

~~tracking a plurality of coefficients in a tracking buffer for timing drift,~~

~~centering the plurality of coefficients in the tracking buffer,~~

filtering, through an equalizer, an instance of the digital signal with ~~the~~ a selected plurality of filter coefficients, corresponding to the contents of a contiguous sequence of coefficient locations within a tracking buffer that has a larger number of coefficient locations than the number of filter coefficients in the selected plurality of filter coefficients; ~~and~~

updating the ~~plurality of coefficients in~~ contents of the tracking buffer responsive to the filtering step;

determining a set of coefficient locations in the tracking buffer having highest coefficient values;

responsive to the set of coefficient locations being at a different position from the selected plurality of filter coefficients within the tracking buffer, selecting a shifted contiguous sequence of coefficient locations for the selected plurality of filter coefficients; and

repeating the filtering and updating steps for a next instance of the digital signal.

2 (currently amended). A method for timing recovery of a digital signal ~~according to claim 1, wherein~~ in a telecommunications receiver, comprising:

~~the step of~~ tracking ~~the~~ a plurality of coefficients ~~further comprises~~ in a tracking buffer for timing drift, the tracking step comprising:

summing a set of left coefficients,

summing a set of center coefficients,

summing a set of right coefficients,

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comparing the set of left coefficients, the set of center coefficients, and the set of right coefficients to obtain a set with the greatest weighting; and

~~the step of~~ centering the plurality of coefficients in the tracking buffer, by ~~further comprises~~ centering the plurality of coefficients about the set with the greatest weighting,

filtering, through an equalizer, the digital signal with the plurality of coefficients, and

updating the plurality of coefficients in the tracking buffer.

3 (currently amended). A method for timing recovery of a digital signal in a telecommunications receiver, comprising:

splitting the digital signal into an in-phase input signal and a quadrature input signal,

~~tracking a plurality of coefficients in a tracking buffer for timing drift, wherein the coefficients are in-phase coefficients,~~

~~centering the plurality of in-phase coefficients in the tracking buffer,~~

~~centering the plurality of quadrature coefficients in the tracking buffer,~~

filtering, through an in-phase equalizer, the in-phase signal with ~~the~~ a selected plurality of in-phase coefficients corresponding to the contents of a contiguous sequence of coefficient locations within an in-phase tracking buffer that has a larger number of coefficient locations than the number of coefficients in the selected plurality of in-phase coefficients,

filtering, through a quadrature equalizer, the quadrature signal with ~~the~~ a selected plurality of quadrature coefficients,

updating the plurality of in-phase coefficients in the tracking buffer, ~~and~~

updating the plurality of quadrature coefficients in the tracking buffer,

determining a set of coefficient locations in the in-phase tracking buffer having highest coefficient values,

responsive to the set of coefficient locations being at a different position from the selected plurality of in-phase coefficients within the in-phase tracking buffer, selecting a shifted contiguous sequence of coefficient locations for the selected plurality of in-phase coefficients, and

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repeating the splitting, filtering, and updating steps.

4 (currently amended). A method for timing recovery according to claim 3, wherein the selected quadrature coefficients correspond to the contents of a contiguous sequence of coefficient locations within a quadrature tracking buffer that has a larger number of coefficient locations than the number of coefficients in the selected plurality of quadrature coefficients and further comprising:

~~tracking a plurality of coefficients in a tracking buffer for timing drift, wherein the coefficients are quadrature coefficients~~ determining a set of coefficient locations in the quadrature tracking buffer having highest coefficient values, and

responsive to the set of coefficient locations being at a different position from the selected plurality of quadrature coefficients within the in-phase tracking buffer, selecting a shifted contiguous sequence of coefficient locations for the selected plurality of quadrature coefficients.

5 (currently amended). A timing recovery device for processing a digital signal, comprising:

an equalizer for processing said digital signal,

a ~~filter~~ tracking buffer having a plurality of coefficient locations defining a length of the tracking buffer, the tracking buffer for storing a plurality of equalizer coefficients in a sequence of coefficient locations that is shorter than the length of the tracking buffer, the plurality of equalizer coefficients to be applied to said equalizer, and

a buffer manager for tracking the ~~equalizer coefficients~~ contents of the coefficient locations within the ~~filter~~ tracking buffer, and for shifting the sequence of coefficient locations in the tracking buffer to be applied as the plurality of equalizer coefficients ~~within the filter buffer such that the coefficients remain substantially centered within the filter buffer~~ responsive to shifts, within the tracking buffer, of a set of coefficient locations having the highest coefficient values.

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6 (currently amended). A timing recovery device according to claim 5, wherein the tracking buffer ~~further~~ comprises:

a data tracking buffer for storing a portion of said digital signal in a plurality of data locations at a selected position of the data tracking buffer, and

a coefficient tracking buffer for storing said equalizer coefficients .

7 (currently amended). A timing recovery device according to claim 5, further comprising:

a data tracking buffer for pointing to ~~said portion of said digital signal stored in~~ a location of said tracking buffer at which a portion of the digital signal is stored, and

a coefficient tracking buffer for pointing to a location of said tracking buffer at which said equalizer coefficients are stored.

8 (canceled).

9 (canceled).

10 (canceled).

11 (previously presented). A receiver, comprising:

an analog-to-digital converter, for converting a received analog signal to digital samples;

an adaptive equalizer, for applying a digital filter to a sequence of the digital samples using a sequence of continually updated filter coefficients;

a tracking buffer, for storing the sequence of filter coefficients, the tracking buffer having a length longer than the length of the sequence of filter coefficients used by the adaptive equalizer; and

buffer management circuitry, for tracking movement, within the tracking buffer, of the position of those filter coefficients having the highest values, and for shifting the position of the sequence of filter coefficients within the tracking buffer, so that those filter coefficients having the highest values are in a central portion of the sequence.

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12 (previously presented). The receiver of claim 11, wherein the tracking buffer comprises:

a data sample tracking buffer, for storing data samples including the sequence of digital samples;

a tap weight tracking buffer, for storing filter coefficients including the sequence of filter coefficients.

13 (currently amended). ~~The~~ A receiver ~~of claim 12~~, comprising:

an analog-to-digital converter, for converting a received analog signal to digital samples;

an adaptive equalizer, for applying a digital filter to a sequence of the digital samples using a sequence of continually updated filter coefficients;

a tracking buffer, for storing the sequence of filter coefficients, the tracking buffer having a length longer than the length of the sequence of filter coefficients used by the adaptive equalizer, and comprising:

a data sample tracking buffer for storing data samples, the data sample tracking buffer including ~~wherein the sequence of digital samples is stored in~~ a data filter buffer within the data sample tracking buffer for storing the sequence of digital samples; and

a tap weight tracking buffer for storing filter coefficients, the tap weight tracking buffer including ~~wherein the sequence of filter coefficients is stored in~~ a coefficient filter buffer within the tap weight tracking buffer for storing the sequence of filter coefficients;

buffer management circuitry, for tracking movement, within the tracking buffer, of the position of those filter coefficients having the highest values, and for shifting ~~wherein the buffer management circuitry shifts~~ the position of the coefficient filter buffer within the tap weight tracking buffer so that those filter coefficients having the highest values are in a central portion of the sequence of filter coefficients~~; and wherein the buffer management circuitry shifts~~ and for shifting the position of the data filter buffer within the data sample tracking buffer corresponding to shifts in the position of the coefficient filter buffer within the tap weight tracking buffer.

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14 (currently amended). ~~The~~ A receiver ~~of claim 12, further~~ comprising:

an analog-to-digital converter, for converting a received analog signal to digital samples;

an adaptive equalizer, for applying a digital filter to a sequence of the digital samples using a sequence of continually updated filter coefficients;

a tracking buffer, for storing the sequence of filter coefficients, the tracking buffer having a length longer than the length of the sequence of filter coefficients used by the adaptive equalizer, the tracking buffer comprising:

a data sample tracking buffer, for storing data samples including the sequence of digital samples; and

a tap weight tracking buffer, for storing filter coefficients including the sequence of filter coefficients;

buffer management circuitry, for tracking movement, within the tracking buffer, of the position of those filter coefficients having the highest values, and for shifting the position of the sequence of filter coefficients within the tracking buffer, so that those filter coefficients having the highest values are in a central portion of the sequence;

a data filter buffer for storing a value pointing to the location of the sequence of digital samples within the data sample tracking buffer; and

a coefficient filter buffer for storing a value pointing to the location of the sequence of filter coefficients within the tap weight tracking buffer;

wherein the buffer management circuitry adjusts the value stored in the coefficient filter buffer so that those filter coefficients having the highest values are in a central portion of the sequence of filter coefficients;

and wherein the buffer management circuitry adjusts the value stored in the data filter buffer corresponding to adjustment of the value stored in the coefficient filter buffer.

15 (currently amended). ~~The~~ A receiver ~~of claim 11, wherein the adaptive equalizer comprises~~ comprising:

an analog-to-digital converter, for converting a received analog signal to digital samples;

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an adaptive equalizer, for applying a digital filter to a sequence of the digital samples using a sequence of continually updated filter coefficients, and comprising:

an in-phase adaptive equalizer for applying a digital filter to a sequence of the digital samples corresponding to an in-phase component of the analog signal, using a sequence of continually updated in-phase filter coefficients; and

a quadrature-phase adaptive equalizer for applying a digital filter to a sequence of the digital samples corresponding to a quadrature-phase component of the analog signal, using a sequence of continually updated quadrature-phase filter coefficients;

a ~~wherein the~~ tracking buffer is for storing the sequence of in-phase filter coefficients and the sequence of quadrature-phase filter coefficients, the tracking buffer having a length longer than the length of the sequence of filter coefficients used by the adaptive equalizer; and

~~wherein the~~ buffer management circuitry ~~is~~ for tracking movement of the position within the tracking buffer of both the in-phase and quadrature-phase filter coefficients having the highest values, and for shifting the position of both the in-phase and quadrature-phase sequences of filter coefficients within the tracking buffer, so that those filter coefficients having the highest values are in a central portion of the sequence.

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